

## CURRENT ORDER AND INVENTORY MODELS IN MANUFACTURING ENVIRONMENTS: A REVIEW FROM 2008 TO 2018

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### ABSTRACT

*One of the issues of designing a supply chain network is "Supply chain ordering management ". Extra costs are the most important factors in the survival of an organization and have a significant impact on the company's competitiveness. However, holding inventory, order accepting, and functional risks are factors that have not been studied simultaneously. The purpose of this paper is to provide a review on order and inventory and use of Activity based costing approach in regard to supply chain management and cost management. This paper selected and reviewed 56 published articles in a decade of 32 important journals related to order and inventory of supply chain manufacturing industries which were chosen from the "Science direct and Scopus" databases and in this regard, the Artificial Neural Network method which called "ANN", ant colony algorithm and queue theory have been proposed. Finally, International Journal of production Economics was ranked as the first. The results of this paper acknowledge that order management and inventory control can help decision makers in solving some problems under uncertainties and situations of demands in the environmental manufacturing industries and this approach has seen increasing interest among previous researchers to use this approach in various steps of supply chain management.*

**KEYWORDS:** Order Management, Inventory Control, Operational Risk & Activity-Based Cost

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### I. INTRODUCTION

The supply chain management is the management of all manufacturing and supplying processes, from raw material to finished customers, that covers the whole value chain from material extraction to product lifetime. Some go further and consider recycling of raw materials in the range of the supply chain management. One of the most important features that can be mentioned in order to manage supply chain orders are: the profitability of orders, long-term orders earnings, increased customer loyalty, long-term cooperation with the company, minimizing the total costs, also it involves forward flows in order to reduce fixed and variable costs and increase customer responsiveness. Applying Dispatch volume limit, increases both the ordering cycle and the total annual costs. With growing up in the number of replenishment, the cost of the system will enhance. Due to gained costs in order to unnecessary redistribution, a significant leap in costs occurs. Furthermore, by increasing maintenance costs and reducing deficiency cost, the total inventory at the end of the periods is reduced. Haji and et al. studied queueing Inventory System in a Two-level Supply Chain with One-for-One Ordering Policy. In this study, the integrated services system was used in a two-level supply chain in which it was located. The retailer only was a vendor and looking for a stock-based stock policy. Inventory system total cost by the retailer is much lower than without a retailer system [4]. Tat and et al. developed Economic-Order-Quantity (EOQ) model with instantaneous

deteriorating items for a vendor-managed inventory (VMI) system. In this survey, they studied the EOQ model for deteriorating items in two cases (with and without shortages) to evaluate how VMI affects supply chain. They considered two-level supply chain (single supplier and a single retailer) with one instantaneous deteriorating item. The results show that VMI works better and provides lower costs in all circumstances of traditional supply chain [10]. Zhang and et al. probed in Multi-objective optimization for sustainable supply chain network design considering multiple distribution channels. The Multi Distribution Centre Supply Chain Network (MDCSCN) model is more innovative and pioneered as it meets the latest requirements and outperforms the conventional Supply Chain Network (SCN). Realization of the paradigm changing of traditional SCN to the new one with multiple distribution channels and the complexity of information analysis, can assist management to schedule with importance of optimizing MDCSCN multiple goals by taking into account efficiency and the capacity of facilities and transportation [22]. Kumar and et al. surveyed in developing of a Novel Lot-sizing Model with Variable Lead Time in Supply Chain Environment. The main point of their results is, as the time of purchasing growth, the amount of economic order will rise too [39].

The study of literature shows that there are several types of inventory control models in multi-product environments. The total cost consists of two components:

- Cost of preparation or ordering costs: includes the cost of adjusting machinery and facility before production in manufacturing sectors. The cost for products provided through the manufacturer consists of the cost of preparing and receiving orders and the cost of transporting goods.
- Maintenance cost: includes the cost of maintaining the parts in the warehouse.

The cost of ordering items is also composed of two components

- The cost of ordering which is independent of the order quantity.
- Variable order costs that depend on the order of the various products.

Costs are generally classified into four groups

- Cost of product unit operations: these costs proportional the number of goods produced, like the cost of machining time, material costs and direct wages.
- Cost of activities related to production categories: such as management and holding inventory costs, set up of devices, and so on.
- Cost of specific product-related activities: such as design cost, process engineering, etc.
- The cost of maintenance activities and management of facilities and equipment: such as rent, utilization, reparation and maintenance costs.

This review paper aims to provide reviews of the current order and inventory models due to cost problems. A wide variety of previous studies reviewed the order management or inventory control supply chain problems such as inventory control problem of logistical systems, but there are several studies that survey in service systems for instance bank as a case study. The remainder of this paper is organized as follows. Section 1 provides an overview of literature of current surveys in order and inventory. Section 2 several critical factors of the researches were highlighted. Section 3 of this paper attempted to discuss on the obtain findings and results and Section 4 provides some conclude remarks,

limitations of this study, and suggestions for future researches.

## **II. LITERATURE REVIEW**

In literature review section, we highlight some important factors that are as follows:

- Extra buffer stock required to eliminate stock out
- Unit cost of time
- Cost of carrying inventory in percentage per year
- Ordering cost in per order
- Demand in lead time
- Number of stock units demanded in time period
- Distribution of demand in lead time
- Procurement lead time
- Minimum stock in any time period
- Number of order per year
- Order quantity
- Economic order quantity
- Re-order point
- Total lead time
- Loss per unit inventory if there is no demand
- Probability of stock out in a cycle (order) [39].
- Set-up cost for supplier to produce component
- Set-up cost for plant to produce product
- Set-up cost for Distribution Centre (DC) to deliver product
- Capacity of plant to design product
- Capacity of supplier to design component
- Unit transportation cost from supplier to plant for component
- Unit transportation cost from plant to DC for product
- Unit purchasing cost of component from supplier
- Unit production cost of product at plant

- Unit cost of throughput
- Maximum production capacity of supplier for component
- Maximum production capacity of plant for product
- Total production capacity of plant
- Minimum throughput
- Quantity of component used in one unit of product
- Service level of supplier
- Service level of plant
- Service level of DC
- Volume of product produced at plant
- Volume of product received at DC
- Volume of component provided by supplier
- Volume of product transferred from plant to DC
- Volume of component transferred from supplier to plant [19].
- Major operation costs share in general operation costs
- Number of identified activity segments
- Share of supply costs in general operation costs [23].

In addition, some critical problems that we mention that are as follows:

Investigating internal interrelationships and provide insights into the operational dynamics of single supply chain enterprises. To better focusing risk monitoring and risk management in the automotive industry supply chains on risks in order to enhance decision making in the upstream supply chain [17]. Taking into consideration the uncertainty of demand, cost of production, allocation of the transportation cost, shortage loss, tax rates and limitation of markdown rates [29]. Cost calculation for more accurate cost information than the traditional volume-based costing (VBC). using ABC approach with two stages to allocate and calculate the manufacturing cost which is based on resources expired of process activities [33]. Sustainable supplier selection and order allocation problem under operational and disruption risk [42], considering different shortage situations [45], minimizing the average total inventory cost [48], risk assessment of existing production units considering availability and human safety criteria [50], deciding the logistics service integrator regarding the location of the customer order decoupling point [52], analyzing the benefits of horizontal collaboration related to perishability, from transportation operations and logistics costs in the Inventory Routing Problem (IRP) with multiple suppliers and customers by developing a decision support model that can address these concerns [55], designing a resilient hub network under operational and disruption risks [56].

Some manufacturing industries that are surveyed in articles as a case study or collocated data from them, include bicycle, refrigerator and nylon plastic manufacturing, façade components, carpet manufacturing facility, automotive supply chain, coal mining enterprises, gas industry, locomotives railways, steel and glass company and energy production units. The methods that are used more than others encompass mathematical model, simulation and heuristic algorithm.

### **III. DISCUSSIONS**

Order management and inventory control also their costs are problems that often puzzles managers and researchers. An enormous range of factor includes re-ordering point, operational risk, lead time, demand and pricing risk, product innovation, reduced collection demands and documentary credits alongside order management and inventory control. Pricing risk, product innovation, reduced collection demands and documentary credits are critical factors that have not studied yet. In this paper, as a result of distribution of researches based on the countries which the highest contribution was from China. European continent has had the largest participation in this field. Regarding to journal distribution, International Journal of Production Economics was ranked as the first journal. Some manufacturing industries that are surveyed in articles as a case study or collocated data from them, comprise bicycle, nylon plastic and refrigerator manufacturing, façade components, the carpet manufacturing facility, automotive supply chain, coal mining enterprises, gas industry, steel and glass company, locomotives railways and energy production units but other manufacturing industries which have not checked out yet such as smart phone plant, clothing producers, paint factory, furniture manufacturing and so on. The methods that are used more than others consist mathematical model, simulation and heuristic algorithm that the applications of artificial neural network, ant colony algorithm and queue theory, still have not probed. Distribution of researches based on year of publication, maximum number of articles which were published is in 2017 by 17 articles as well as, minimum number of articles which were published is in 2010 by an article.

### **IV. CONCLUSIONS & RECOMMENDATIONS**

This review paper aimed to review previous studies that applied order management and inventory control during 2008 until 2018 in 32 international scholarly journals which are indexed in Science direct and Scopus databases. As a result of probing 56 articles, 6 articles have implemented ABC approaches, nevertheless, the need for further research is felt in setting of inventory and order of the means of production that not considered synchronously. Moreover, a number of factors for instance product innovation, reduced collection demands and documentary credits are important too that have not surveyed yet. Based on review findings, research methods for instance the applications of artificial neural networks, ant colony algorithm and queue theory have not studied also, we recommended them for future researches. This review paper probes articles that are published in Science direct and Scopus databases, thus, future review researches can peruse other databases. In addition; our review paper only focused on English scholarly journals rather than other languages, therefore; future review surveys can consider and focus on other languages. Because of the importance and necessity of researching in order and inventory, it is recommended that in the fields of operational risk, the collection of demands and documentary credits along with ABC approach come to future studies. It is also suggested that a combination model of these four items will be presented. These fields mentioned above are critical to answer the needs and orders of all customers as well as the survival of an organization, which if ignored, the organization will face with a lack of funds and, in consequence, a bankruptcy and elimination of the competition cycle completely will come about. Moreover, it is recommended that further researches will be done in the fields mentioned with different states of multi-product, single-product or perishable products and green supply chain, also their costs or the closed-loop supply chain with two forward and backward flows to help

managers in costs managing of their supply and demand and organization's survival.

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